

What is Claimed is:

1. A method for manufacturing a metal line contact plug of a semiconductor device, the method comprising:

5 depositing a conductive material for a wordline on a semiconductor substrate;
forming a wordline pattern by depositing a hard mask nitride film on an overlapping portion of the conductive material for the wordline;

forming a nitride spacer on a sidewall of the wordline pattern;

forming a planarized interlayer insulating film on the upper portion of the wordline

10 pattern;

forming a contact hole by etching the interlayer insulating film when the substrate is exposed;

forming a silicon layer on the surface of the interlayer insulating film where the contact hole is formed on;

15 performing a primary CMP process on the silicon layer using a first slurry for an oxide film until the interlayer insulating film is exposed; and

performing a secondary CMP process on the silicon layer and the interlayer insulating film using a second CMP slurry for an oxide film including a solvent, an abrasive dispersed in the solvent and an alkyl ammonium salt ($R_{(4-n)}H_nN^+X^-$ wherein, n is an integer ranging from
20 0 to 3) having a high affinity to the oxide film until the hard mask nitride film is exposed.

2. The method according to claim 1, wherein R of the alkyl ammonium salt is selected from the group consisting of linear C_{10} - C_{50} alkyl and branched C_{10} - C_{50} alkyl.

25 3. The method according to claim 2, wherein R is selected from the group consisting of linear C_{10} - C_{20} alkyl and branched C_{10} - C_{20} alkyl.

4. The method according to claim 1, wherein the R includes an unsaturated alkyl group having at least one or more of double bond or triple bond.

30 5. The method according to claim 1, wherein X^- of the alkyl ammonium salt is selected from the group consisting of F^- , Cl^- , Br^- , I^- , CO_3^{2-} , PO_4^{3-} and SO_4^{2-} .

6. The method according to claim 1, wherein the alkyl ammonium salt is selected from the group consisting of cetyltrimethylammonium chloride, dodecylethyldimethylammonium bromide, oleyltriethylammonium bromide and didecyldimethylammonium phosphate.

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7. The method according to claim 1, wherein the alkyl ammonium salt is present in an amount ranging from 0.01 to 10 wt% based on the CMP slurry.

8. The method according to claim 7, wherein the alkyl ammonium salt is present
10 in an amount ranging from 0.01 to 1 wt% based on the CMP slurry.

9. The method according to claim 1, wherein the abrasive is a colloidal or fumed SiO₂ having a particle size ranging from 50 to 300 nm.

15 10. The method according to claim 1, wherein the abrasive is Al₂O₃.

11. The method according to claim 1, wherein the second slurry for an oxide film has a pH ranging from 2 to 7.

20 12. The method according to claim 1, wherein the second slurry for an oxide film has an pH ranging from 8 to 12.

13. The method according to claim 1, wherein the conductive material is selected from the group consisting of doped silicon, poly-silicon, tungsten (W), tungsten nitride (WN),
25 tungsten silicide (WSi_x) and titanium silicide (TiSi_x).

14. The method according to claim 1, wherein the wordline pattern is formed by an etching process using CCl₄ or Cl₂ gas.

30 15. The method according to claim 1, wherein the spacer is formed of TEOS (Tetraethoxysilicate glass) or silane (SiH₄)-based oxide film.

16. The method according to claim 1, wherein the interlayer insulating film is selected from the group consisting of BPSG (borophosphosilicate glass), PSG (phosphosilicate glass), FSG (fluorosilicate glass), PE-TEOS (plasma enhanced tetraethoxysilicate glass), PE-SiH₄ (plasma enhanced-silane), HDP USG (high density plasma undoped silicate glass), HDP PSG (high density plasma phosphosilicate glass) and APL (atomic planarization layer) oxide.

17. The method according to claim 1, wherein the contact hole is formed by an etching process using a C₄F₈, C₂F₆ or C₃F₈ source.

18. The method according to claim 1, wherein the silicon layer is formed of doped silicon or poly-silicon using a SiH₄ or Si₂H₆ source.

19. The method according to claim 1, wherein the CMP process is performed using a hard pad.